

Inflation-Adjusted Medicare Reimbursement Has Decreased for Orthopaedic Sports Medicine Procedures

Analysis From 2000 to 2020

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Background: Decreases in Medicare reimbursement have been noted among many medical specialties. An in-depth analysis of the subspecialty of orthopaedic sports medicine is needed to determine changes in Medicare reimbursement in this field.

Purpose/Hypothesis: The purpose was to elucidate the trends in inflation-adjusted Medicare reimbursement for orthopaedic sports medicine procedures between 2000 and 2020. It was hypothesized that Medicare reimbursement decreased substantially during the study period.

Study Design: Economic decision and analysis; Level of evidence, 4.

Methods: The Physician Fee Schedule Look-up Tool was used to extract Medicare reimbursement information between 2000 and 2020 for 67 procedures related to orthopaedic sports medicine. These values were adjusted for inflation using the Consumer Price Index. The compound annual growth rate (CAGR) was calculated to measure the annual rate of change, and descriptive analyses were performed using the Student *t* test.

Results: Between 2000 and 2020, inflation-adjusted Medicare reimbursement for the 67 included procedures decreased by an average of 33% (CAGR = -2.2% ; $R^2 = 0.78$). Reimbursement decreased for procedures related to the shoulder and elbow by 34% (CAGR = -2.3% ; $R^2 = 0.80$), for hip-related procedures by 23% (CAGR = -1.4% ; $R^2 = 0.77$), for knee-related procedures by 31% (CAGR = -2.0% ; $R^2 = 0.81$), and for procedures relating to the foot and ankle by 38% (CAGR = -2.5% ; $R^2 = 0.79$).

Conclusion: Study findings indicated that inflation-adjusted Medicare reimbursement decreased substantially between 2000 and 2020 for orthopaedic sports medicine procedures, ranging from a 23% decrease for hip-related procedures to a 38% decrease for foot and ankle-related procedures. The results of this study could be used to provide further context for health care policy decisions and help ensure sustainable financial environments for orthopaedic sports medicine surgeon.

Keywords: orthopaedic sports medicine; orthopaedic sports surgeon; Medicare; Medicare reimbursement

Medicare was established in the United States to provide medical coverage for those aged >65 years and others with qualifying health conditions. It is currently the largest insurer in the United States.^{6,8} Since its inception, Medicare has been rapidly expanding alongside the growing elderly population.¹⁶ When Medicare was established in 1965, the median life expectancy in the United States was 70.11 years, whereas it is currently estimated to be 78.81 years.³⁸ The increasing proportion of patients covered by Medicare provides an impetus for economic study.

Within Medicare, orthopaedic surgeons are reimbursed a professional procedural fee based on the specific service performed. Each procedure carries a corresponding Current Procedural Terminology (CPT) code that is specific to each medical procedure and service. Each CPT code has an assigned physician reimbursement according to the valuation of the relative value units (RVUs) determined by the relative value update committee (RUC).¹⁵ These payments are also adjusted by geographic region.

Decreasing Medicare reimbursement has been noted among many specialties.^{13,18,20,21,32,33} Furthermore, many orthopaedic surgery subspecialties including total joint replacement, trauma, hand and wrist, and shoulder have reported decreases.^{17,19,28,36,40} While these subspecialties

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TABLE 1
Reasons for Exclusion of 13 Procedures From This Study^a

CPT Code	Description of CPT Code	Reason for Exclusion
27412	Autologous chondrocyte implantation, knee	Did not exist in 2000
27415	Osteochondral allograft, knee, open	Did not exist in 2000
29806	Arthroscopy, shoulder, surgical; capsulorrhaphy	Did not exist in 2000
29807	Arthroscopy, shoulder, surgical; repair of SLAP lesion	Did not exist in 2000
29824	Arthroscopy, shoulder, surgical; distal claviclectomy including distal articular surface (Mumford)	Did not exist in 2000
29827	Arthroscopy, shoulder, surgical; with rotator cuff repair	Did not exist in 2000
29828	Treatment for arthroscopic surgical biceps tenodesis	Did not exist in 2000
29866	Arthroscopy, knee, surgical; osteochondral autograft (eg, mosaicplasty) (includes harvesting of the autograft)	Did not exist in 2000
29867	Arthroscopy, knee, surgical; osteochondral allograft (eg, mosaicplasty)	Did not exist in 2000
29868	Arthroscopy, knee, surgical; meniscal transplantation (includes arthrotomy for meniscal insertion)	Did not exist in 2000
29873	Arthroscopy, knee, surgical; with lateral release	Did not exist in 2000
24345	Repair medial collateral ligament, elbow, with local tissue	Did not exist in 2000
24346	Reconstruction medial collateral ligament, elbow, with tendon graft (includes harvesting of graft)	Did not exist in 2000

^aCPT, Current Procedural Terminology; SLAP, superior labrum anterior and posterior.

have been well defined, there is a paucity of literature regarding Medicare reimbursement in orthopaedic sports medicine. One such applicable study by Moore et al²⁹ examined arthroscopic procedures and reported a 30% decrease in reimbursement for the included 20 procedures. Notwithstanding, Moore et al²⁹ examined a limited number of specific arthroscopic procedures.

The purpose of this study was to further elucidate the trends in inflation-adjusted Medicare reimbursement in the field of orthopaedic sports medicine between 2000 and 2020 and to provide subanalysis by anatomic location. The authors hypothesized that Medicare reimbursement for orthopaedic sports medicine procedures decreased by at least 20% across all anatomic locations during the study period.

METHODS

Institutional review board approval was not required for this study, as only publicly available data were used in this analysis. The methods of this study were adapted from similar studies examining Medicare reimbursement trends.^{13,18,29} Orthopaedic sports medicine-specific procedures were obtained from the orthopaedic sports medicine Accreditation Council for Graduate Medical Education (ACGME) case log guidelines, which contain a comprehensive and categorized list of orthopaedic procedures and CPT

codes related to orthopaedic sports medicine.¹ Services not existing in 2000 or 2020 were excluded from this analysis (n = 13) (Table 1).

Reimbursement data for each of the included CPT codes from the Centers for Medicare and Medicaid Services (CMS) website were obtained by 3 authors (J.R.P., E.H.R., B.I.E.) using the Physician Fee Schedule Look-Up Tool.⁹ The pricing information for each geographic Medicare Administrative Contractor locality across the country between 2000 and 2020 was averaged to obtain a national average reimbursement for each code for each year. To adjust for substantial inflation between 2000 and 2020, the reimbursement averages for each CPT code were adjusted according to the change in Consumer Price Index from the US Department of Labor, Bureau of Labor Statistics website.⁴¹ We adjusted for inflation by multiplying the 2000 reimbursement of each code by the 2000 January inflation multiplier. This process was repeated for each year and each code. The average annual change and total percentage change between 2000 and 2020 were calculated after adjusting for inflation for each procedure and on average across all procedures. These same analyses were performed for each category of sports procedures according to their designation in the ACGME case log. These categories were shoulder and elbow, hip, knee, and foot and ankle.

The compound annual growth rate (CAGR) was calculated using the inflation-adjusted monetary data from 2020 and 2000. The CAGR is a common economic measure

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Ethical approval was not sought for the present study.

that is utilized to control for variability over stretches of time. CAGR also provides a more realistic and precise measure of annual rate of change.¹⁴ CAGR is calculated using the following formula:

$$CAGR = \left[\left(\frac{2020 \text{ Value}}{2000 \text{ Value}} \right)^{\frac{1}{2020-2000}} \right] - 1$$

An R^2 regression value was also calculated to estimate the goodness of fit of the changing reimbursement values to a linear model.

Additionally, a subanalysis was performed to compare the average change in reimbursement among all included procedures between 2000-2010 and 2011-2020. This subanalysis was carried out using a 2-tailed t test comparison of

means. All statistics and calculations were performed using Microsoft Excel for Office 365 (Microsoft Corp). Alpha level was set at < 0.05 .

RESULTS

Overall, inflation-adjusted mean Medicare reimbursement for the included 67 CPT codes decreased from \$1171 on average in 2000 to \$783 on average in 2020. Additionally, the median inflation-adjusted reimbursement of all codes between 2000 and 2020 decreased by 33% (range, -15% to -84%). This analysis included 67 CPT codes after excluding 13 codes that did not exist in either 2000 or 2020 (Table 2).

Foot and ankle sports medicine procedures had the lowest average reimbursement for all 20 years between 2000 and 2020, while knee procedures had the highest average Medicare reimbursement for all years. All categories experienced a similar downward trend in reimbursement from year to year, ranging from a mean decrease of 23% for hip to 38% for foot and ankle (Figure 1).

The reimbursement for each individual code is shown in Appendix Table A1. Overall, the mean R^2 regression value for the 67 included orthopaedic sports medicine procedures was 0.78, which was reflective of a moderately strong constant linear decline in reimbursement between 2000 and 2020. The mean CAGR for all included procedures was -2.2%, which was also indicative of a consistent yearly decline in reimbursement between 2000 and 2020 (Appendix Table A1).

Inflation-adjusted Medicare reimbursement for the 21 shoulder and elbow procedures decreased from \$1190 in 2000 to \$777 in 2020 (34% decrease). The largest decrease (84% decrease) was seen for CPT code 29826, which represents subacromial space decompression with partial acromioplasty and coracoacromial release. The smallest

TABLE 2
Differences in Inflation-Adjusted Medicare Reimbursement Between Sports Medicine Procedures^a

Procedure	No. of CPT Codes	Average Inflation-Adjusted Medicare Reimbursement, USD		
		2000	2020	Change
Shoulder and elbow	21	1190	777	-34%
Hip	4	1043	793	-23%
Knee	29	1259	862	-31%
Foot and ankle	13	984	613	-38%
Overall	67	1171	783	-33%

^aCPT, Current Procedural Terminology; USD, US dollars.

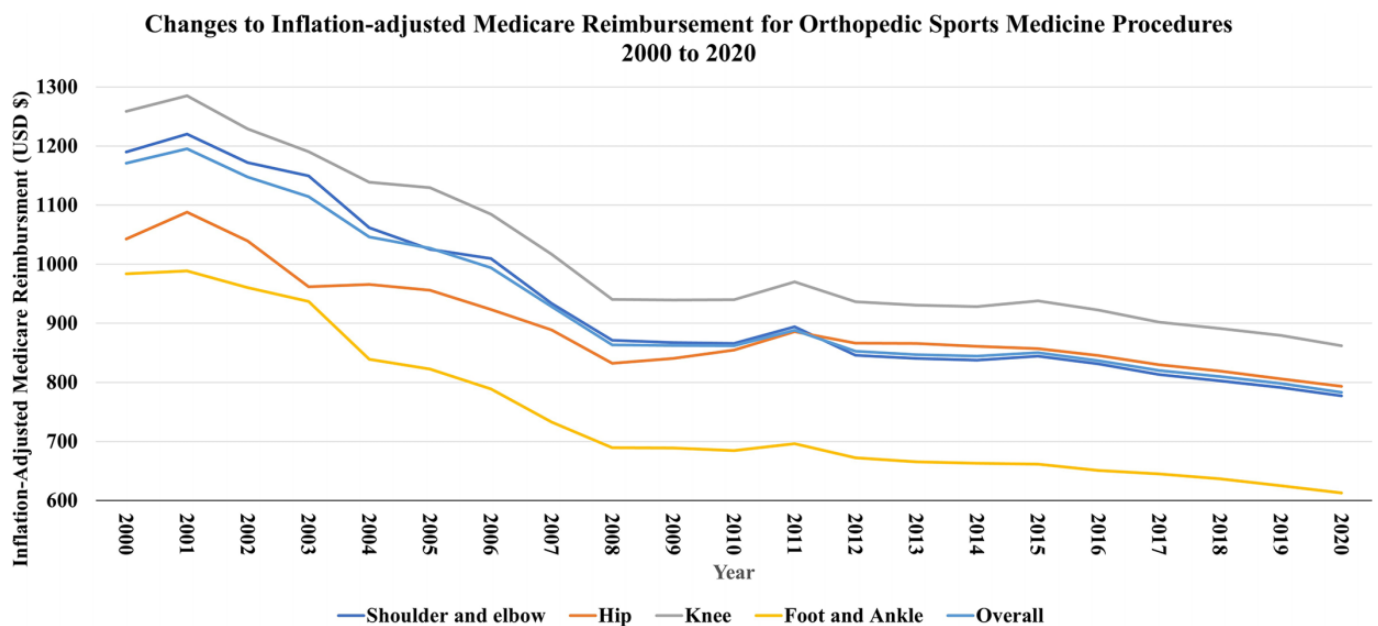


Figure 1. Summary of differences among orthopaedic sports medicine procedures between 2000 and 2020. USD, US dollars.

TABLE 3
Inflation-Adjusted Medicare Reimbursement Between 2000 and 2020 by Orthopaedic Sports Medicine–Related Shoulder and Elbow CPT Code^a

Description	CPT Code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with or without coracoacromial release	29826	1119	184	-9.1%	0.88	-84%
Repair of ruptured musculotendinous cuff (eg, rotator cuff), open; acute	23410	1436	877	-2.6%	0.58	-39%
Capsulorrhaphy, anterior; with labral repair (eg, Bankart procedure)	23455	1699	1050	-2.5%	0.82	-38%
Reconstruction of complete shoulder (rotator) cuff avulsion, chronic (includes acromioplasty)	23420	1633	1036	-2.4%	0.85	-37%
Capsulorrhaphy, anterior, any type; with coracoid process transfer	23462	1753	1129	-2.3%	0.82	-36%
Capsulorrhaphy, anterior; Putti-Platt procedure or Magnuson-type operation	23450	1534	1001	-2.2%	0.80	-35%
Capsulorrhaphy, anterior, any type; with bone block	23460	1729	1151	-2.1%	0.82	-33%
Capsulorrhaphy, glenohumeral joint, posterior, with or without bone block	23465	1772	1182	-2.1%	0.83	-33%
Open treatment of acromioclavicular dislocation, acute or chronic	23550	889	606	-2.0%	0.80	-32%
Resection or transplantation of long tendon of biceps	23440	1169	810	-1.9%	0.79	-31%
Capsulorrhaphy, glenohumeral joint, any type multidirectional instability	23466	1689	1173	-1.9%	0.79	-31%
Tenodesis of long tendon of biceps	23430	1142	798	-1.9%	0.77	-30%
Arthroscopy, elbow, surgical; debridement, limited	29837	795	557	-1.8%	0.83	-30%
Acromioplasty or acromionectomy, partial, with or without coracoacromial ligament release	23130	939	661	-1.8%	0.75	-30%
Arthroscopy, elbow, surgical; synovectomy, partial	29835	760	538	-1.8%	0.82	-29%
Arthroscopy, elbow, surgical; with removal of loose body or foreign body	29834	736	520	-1.8%	0.83	-29%
Arthroscopy, elbow, surgical; debridement, extensive	29838	875	626	-1.7%	0.83	-28%
Arthroscopy, elbow, surgical; synovectomy, complete	29836	862	618	-1.7%	0.83	-28%
Open treatment of acromioclavicular dislocation, acute or chronic; with fascial graft (includes obtaining graft)	23552	955	691	-1.7%	0.81	-28%
Arthroscopy, elbow, diagnostic, with or without synovial biopsy (separate procedure)	29830	664	483	-1.7%	0.81	-27%
Claviclectomy; partial	23120	842	631	-1.5%	0.67	-25%
Mean		1190	777	-2.3%	0.80	-34%
Median		1119	691	-1.9%	0.82	-31%

^aCAGR, compound annual growth rate; CPT, Current Procedural Terminology; USD, US dollars.

TABLE 4
Orthopaedic Sports Medicine–Related Inflation-Adjusted Medicare Reimbursement, 2000-2020: Hip Codes^a

Description	CPT Code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Arthroscopy, hip, surgical; with removal of loose body or foreign body	29861	1072	762	-1.8%	0.77	-29%
Arthroscopy, hip, surgical; with debridement/shaving of articular cartilage (chondroplasty), abrasion arthroplasty, and/or resection of labrum	29862	1150	852	-1.6%	0.81	-26%
Arthroscopy, hip, surgical; with synovectomy	29863	1116	855	-1.4%	0.77	-23%
Arthroscopy, hip, diagnostic with or without synovial biopsy (separate procedure)	29860	833	705	-0.9%	0.74	-15%
Mean		1043	793	-1.4%	0.77	-23%
Median		1094	807	-1.5%	0.77	-25%

^aCAGR, compound annual growth rate; CPT, Current Procedural Terminology; USD, US dollars.

decrease (25% decrease) was seen for CPT code 23120, which represents partial claviclectomy (Table 3).

Inflation-adjusted Medicare reimbursement for the 4 hip procedures decreased from \$1043 in 2000 to \$793 in 2020 (23% decrease). The largest decrease (29% decrease) was seen for CPT code 29861, which is hip arthroscopy with

removal of loose body or foreign body. The smallest decrease (15% decrease) was seen for CPT code 29860, which is diagnostic hip arthroscopy with or without synovial biopsy (Table 4).

Inflation-adjusted Medicare reimbursement for knee procedures decreased from \$1259 in 2000 to \$862 in 2020

TABLE 5
Orthopaedic Sports Medicine–Related Inflation-Adjusted Medicare Reimbursement, 2000-2020: Knee Codes^a

Description	CPT code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Open treatment of knee dislocation, with or without internal or external fixation; without primary ligamentous repair or augmentation/reconstruction	27556	1627	927	-2.9%	0.85	-43%
Repair of ruptured musculotendinous cuff (eg, rotator cuff), open; chronic	23412	1575	911	-2.8%	0.85	-42%
Arthroscopy, knee, surgical; with meniscectomy (medial AND lateral, including any meniscal shaving)	29880	1024	594	-2.8%	0.93	-42%
Open treatment of knee dislocation, with or without internal or external fixation; with primary ligamentous repair	27557	1875	1106	-2.7%	0.87	-41%
Arthroscopy, knee, surgical; with meniscectomy (medial OR lateral, including any meniscal shaving)	29881	942	572	-2.6%	0.93	-39%
Arthroscopically aided anterior cruciate ligament repair/augmentation or reconstruction	29888	1643	1036	-2.4%	0.80	-37%
Open treatment of knee dislocation, with or without internal or external fixation; with primary ligamentous repair, with augmentation/reconstruction	27558	1937	1260	-2.2%	0.86	-35%
Osteotomy, proximal tibia, including fibular excision or osteotomy (includes correction of genu varus)	27457	1532	1016	-2.1%	0.84	-34%
Repair, primary, torn ligament and/or capsule, knee; collateral and cruciate ligaments	27409	1537	1022	-2.1%	0.80	-34%
Ligamentous reconstruction (augmentation), knee; extra-articular	27427	1130	752	-2.1%	0.81	-33%
Reconstruction of dislocating patella; with extensor realignment and/or muscle advancement or release (eg, Campbell, Goldwaite-type procedure)	27422	1179	787	-2.1%	0.81	-33%
Reconstruction of dislocating patella (eg, Hauser-type procedure)	27420	1175	786	-2.1%	0.81	-33%
Repair, primary, torn ligament and/or capsule, knee; collateral	27405	1067	715	-2.1%	0.78	-33%
Reconstruction of dislocating patella; with patellectomy	27424	1175	791	-2.1%	0.80	-33%
Arthrotomy with meniscus repair, knee	27403	1004	680	-2.0%	0.81	-32%
Arthroscopy, knee, surgical; with meniscus repair (medial OR lateral)	29882	1038	732	-1.8%	0.75	-30%
Open treatment of patellar dislocation, with or without partial or total patellectomy/reconstruction	27566	1327	944	-1.8%	0.84	-29%
Lateral retinacular release, open	27425	669	476	-1.8%	0.73	-29%
Coracoacromial ligament release, with or without acromioplasty	23415	1044	748	-1.7%	0.81	-28%
Arthroscopy, knee, surgical; abrasion arthroplasty (includes chondroplasty where necessary)	29879	972	699	-1.7%	0.76	-28%
Repair, primary, torn ligament and/or capsule, knee; cruciate	27407	1164	840	-1.7%	0.76	-28%
Arthroscopy, knee, surgical; drilling for intact osteochondritis dissecans lesion with internal fixation	29887	1097	794	-1.7%	0.74	-28%
Arthroscopy, knee, surgical; debridement/shaving of articular cartilage (chondroplasty)	29877	897	656	-1.6%	0.75	-27%
Ligamentous reconstruction (augmentation), knee; intra-articular (open)	27428	1605	1178	-1.6%	0.80	-27%
Arthroscopy, knee, surgical; drilling for osteochondritis dissecans with bone grafting, with or without internal fixation (including debridement of base of lesion)	29885	1054	797	-1.5%	0.76	-24%
Arthroscopy, knee, surgical; osteochondral autograft (eg, mosaicplasty) (includes harvesting of the autograft)	29866	884	672	-1.4%	0.73	-24%
Arthroscopy, knee, surgical; with meniscus repair (medial AND lateral)	29883	1128	889	-1.2%	0.82	-21%
Arthroscopically aided posterior cruciate ligament repair/augmentation or reconstruction	29889	1590	1292	-1.1%	0.82	-19%
Ligamentous reconstruction (augmentation), knee; intra-articular (open) and extra-articular	27429	1613	1325	-1.0%	0.81	-18%
Mean		1259	862	-2.0%	0.81	-31%
Median		1164	794	-2.0%	0.81	-32%

^aCAGR, compound annual growth rate; CPT, Current Procedural Terminology; USD, US dollars.

(31% decrease). The largest decrease (43% decrease) was seen for CPT code 27556, which is open treatment of knee dislocation without primary ligamentous repair or augmentation/reconstruction. The smallest decrease (18% decrease) was seen for CPT code 27429, which is intra-

articular and extra-articular ligamentous reconstruction (augmentation) of the knee (Table 5).

Inflation-adjusted Medicare reimbursement for foot and ankle procedures decreased from \$984 in 2000 to \$613 in 2020 (38% decrease). The largest decrease (45% decrease)

TABLE 6
Orthopaedic Sports Medicine–Related Inflation-Adjusted Medicare Reimbursement, 2000-2020: Foot and Ankle Codes^a

Description	CPT Code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Open treatment of metatarsal fracture, with or without internal or external fixation, each	28485	1067.2	585.5	-3.1%	0.39	-45%
Repair, primary, open or percutaneous, ruptured Achilles tendon; with graft (includes obtaining graft)	27652	1184.8	703.7	-2.7%	0.90	-41%
Repair, primary, disrupted ligament, ankle; collateral	27695	835.3	502.1	-2.6%	0.78	-40%
Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical; with removal of loose body or foreign	29894	875.6	528.0	-2.6%	0.81	-40%
Repair, secondary, disrupted ligament, ankle, collateral (eg, Watson-Jones procedure)	27698	1117.7	674.7	-2.6%	0.82	-40%
Repair, primary, disrupted ligament, ankle; both collateral ligaments	27696	959.0	591.0	-2.5%	0.82	-38%
Repair, dislocating peroneal tendons; without fibular osteotomy	27675	831.7	519.6	-2.4%	0.81	-38%
Repair, primary, open or percutaneous, ruptured Achilles tendon	27650	1102.1	696.0	-2.4%	0.85	-37%
Repair, secondary, Achilles tendon, with or without graft	27654	1188.5	754.3	-2.4%	0.77	-37%
Fasciectomy, plantar fascia; partial (separate procedure)	28060	591.5	381.6	-2.3%	0.75	-35%
Arthroscopically aided repair of large osteochondritis dissecans lesion, talar dome fracture	29892	1058.8	690.0	-2.2%	0.88	-35%
Repair, dislocating peroneal tendons; with fibular osteotomy	27676	966.3	633.0	-2.2%	0.82	-34%
Arthroscopy, ankle, surgical; excision of osteochondral defect of talus and/or tibia, including drilling	29891	1008.7	709.0	-1.8%	0.85	-30%
Mean		984	613	-2.5%	0.79	-38%
Median		1009	633	-2.4%	0.82	-38%

^aCAGR, compound annual growth rate; CPT, Current Procedural Terminology; USD, US dollars.

TABLE 7
Change in Orthopaedic Sports Medicine–Related Medicare Reimbursement: 2000-2010 Versus 2011-2020

	2000-2010	2011-2020	P
Average % change in reimbursement	-26.0%	-12.0%	<.0001

was seen for CPT code 28485, which is open treatment of a metatarsal fracture. The smallest decrease (30% decrease) was seen for CPT code 29891, which is ankle arthroscopy with excision of osteochondral defect of talus and/or tibia, including drilling (Table 6).

The subanalysis regarding the mean adjusted reimbursement values for all procedures between 2000-2010 and 2011-2020 revealed a statistically significant difference between the 2 time periods ($P < .0001$) (Table 7).

DISCUSSION

We found that Medicare inflation-adjusted reimbursement decreased substantially between 2000 and 2020 for orthopaedic sports medicine procedures. There was a 33% mean decrease overall, ranging from a 23% decrease in reimbursement for orthopaedic sports medicine hip-related codes to 38% for orthopaedic sports medicine foot and ankle-related codes. Throughout this time period, the sports medicine codes with the highest reimbursement each year were related to knee procedures, while the codes

associated with the lowest reimbursement each year were related to foot and ankle procedures. There was also evidence of a consistent yearly decline in reimbursement, which is reflected by an R^2 value of 0.78 and a CAGR of -2.2%. These decreases in reimbursement are compounded by a large increase of Medicare patients, with Medicare beneficiaries increasing from 13.5% of the US population in 2000 to nearly 18.1% in 2019.³⁹ While the proportion of patients covered by Medicare in sports medicine orthopaedic practices remains unclear, changes in Medicare reimbursement have been shown to substantially affect private payors, and as such, changes to Medicare reimbursement have a far-reaching effect.¹⁰ The results of this study could be used to provide further context for health care policy decisions and help ensure sustainable financial environments for orthopaedic sports medicine surgeons.

Orthopaedic sports medicine has experienced a similar decrease in reimbursement to other fields of orthopaedic surgery, with the mean inflation-adjusted Medicare reimbursement decreasing 39% for hip and knee arthroplasty,¹⁷ 27% for shoulder and elbow surgeries,²⁸ 22.6% for hand surgeries,⁴⁰ 30% for commonly performed arthroscopy procedures,²⁹ and 30% for orthopaedic trauma.¹⁹ Accordingly, this study corroborates the findings of decreasing reimbursement found in other subspecialties of orthopaedic surgery and further defines the reimbursement decrease in orthopaedic sports medicine (Appendix Table A2).

It is traditionally thought that Medicare reimbursement is significantly less than that of commercial payors. However, this difference varies by procedure. For example, the commercial payor average for “shoulder arthroscopy” in 2011 was

more than double that of Medicare reimbursement, while commercial payment for “shoulder arthroscopy: capsulorrhaphy” was only 16% more than Medicare reimbursement.¹² While both commercial and Medicare payments for orthopaedic surgeries were noted to decrease markedly between 2010 and 2018, Medicare payments decreased by an average of 1.5 times faster than commercial payments.⁴³ This study also found that, on average, payments from Medicare for orthopaedic surgeries were 57% less than payments from commercial payors.⁴³ The decreasing reimbursement trends seen in this study for orthopaedic sports medicine are likely similar to decreasing reimbursement trends by commercial payors, albeit to a lesser degree. Reimbursement trends of large, commercial payors warrant future analysis to further define these trends.

Health care policy changes over the last 2 decades further contextualize the findings of decreasing Medicare reimbursement, such as the Balanced Budget Act of 1997 (BBA), Medicare Access and Children’s Health Insurance Program Reauthorization Act of 2015 (MACRA), Merit-based Incentive Payment System (MIPS), and bundled payment programs.^{7,30,31,37} The BBA was enacted in 1997 and created the sustainable growth rate (SGR), which cut payment for physicians, and by 2002, the SGR reduced overall payment rates by 4.8%.⁵ After years of physician payment cuts from the SGR, the BBA was subsequently replaced by MACRA in 2015 in an attempt to focus on quality of services rather than quantity of services.⁷ Under MACRA, 2 payment options were created in 2017 named Alternative Payment Models and Merit-based Incentive Payment System (MIPS).⁷ These models were designed to give positive or negative payment adjustments based on certain parameters of care.³⁷ As a result of the changes brought about from these health care policy changes, investigations have aimed to help orthopaedic surgeons understand how to navigate these changes.^{4,34} In the context of these policies, this study found a statistically significant difference between 2000-2010 and 2011-2020 reimbursement differences. The average decrease in reimbursement for orthopaedic sports procedures was 26% between 2000 and 2010 and 12% between 2011 and 2020.

Annual adjustments to CPT code pricing are made on an annual basis by the RUC, based on many factors, including physician work and time required to perform a service, practice expense, and malpractice costs.³ This committee consists of 32 volunteer physicians from various specialties, including 1 representative orthopaedic surgeon.³ These physicians alter the valuation of CPT codes by adjusting the associated RVUs. The 3 RVU components, which hold different weights, are work RVU, practice expense RVU, and malpractice RVU. These RVUs also have a geographic adjustment named the work geographic pricing cost index (GPCI), practice expense GPCI, and malpractice GPCI. These factors are multiplied together with the yearly conversion factor to determine physician payment.

It has been reported that the RVUs and payment determined by the RUC may not accurately reflect work effort for certain procedures.¹¹ A prominent example of this is septic revision total hip arthroplasty, in which the complexity and difficulty of the case are not reflected in the RVU and payments determined by the RUC.³⁵ As a result, surgeons may

limit or avoid performing certain procedures and ultimately limit access for patients to needed procedures.²² Additionally, it has been demonstrated that arthroscopic procedures generate more RVUs per hour than the same procedures performed using an open approach.²⁴ These changes could influence surgical treatment decisions unnecessarily. Our study found heterogeneity between the rate of decreasing reimbursement between different procedure categories, with foot and ankle codes exhibiting the largest decrease. Awareness of these trends is necessary to ensure equitable reimbursement between subspecialties and procedures, all of which play a critical role in providing quality orthopaedic care in the United States. Future study is needed to explore possible solutions to decreasing Medicare reimbursement in orthopaedic sports medicine surgery.

This study is not without limitations. This study only used the data from a single payor. Therefore, the trends observed in this study may not represent reimbursement by third-party payors. Further study is needed to elucidate trends in reimbursement amount from third-party payors between 2000 and 2020. The authors of this study understand that the limited number of codes included do not represent all the possible procedures and services performed by orthopaedic sports medicine surgeons. However, the authors believe that the CPT codes included in this analysis likely represent a balanced picture of a typical orthopaedic sports medicine surgical practice. Further study is needed to fully analyze the effects of decreased Medicare reimbursement in orthopaedic sports medicine on surgeons, patients, and hospitals.

CONCLUSION

Medicare reimbursement decreased substantially between 2000 and 2020 for orthopaedic sports medicine procedures, ranging from a 23% decrease in inflation-adjusted Medicare reimbursement for hip-related procedures to a 38% decrease for foot and ankle-related procedures. The results of this study could be used to provide further context for health care policy decisions and help ensure sustainable financial environments for orthopaedic sports medicine surgeons.

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APPENDIX

APPENDIX TABLE A1
All 67 Included Procedures and Their Inflation-Adjusted Reimbursement in 2000 and 2020, Sorted by Largest to Smallest Percentage Change^a

Description	CPT Code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with or without coracoacromial release	29826	1119	184	-9.1%	0.87	-84%
Open treatment of metatarsal fracture, with or without internal or external fixation, each	28485	1067	585	-3.1%	0.41	-45%
Open treatment of knee dislocation, with or without internal or external fixation; without primary ligamentous repair or augmentation/reconstruction	27556	1627	927	-2.9%	0.83	-43%
Repair of ruptured musculotendinous cuff (eg, rotator cuff), open; chronic	23412	1575	911	-2.8%	0.83	-42%
Arthroscopy, knee, surgical; with meniscectomy (medial AND lateral), including any meniscal shaving	29880	1024	594	-2.8%	0.92	-42%
Open treatment of knee dislocation, with or without internal or external fixation; with primary ligamentous repair	27557	1875	1106	-2.7%	0.85	-41%
Repair, primary, open or percutaneous, ruptured Achilles tendon; with graft (includes obtaining graft)	27652	1185	704	-2.7%	0.89	-41%
Repair, primary, disrupted ligament, ankle; collateral	27695	835	502	-2.6%	0.75	-40%
Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical; with removal of loose body or foreign	29894	876	528	-2.6%	0.78	-40%
Repair, secondary, disrupted ligament, ankle, collateral (eg, Watson-Jones procedure)	27698	1118	675	-2.6%	0.80	-40%
Arthroscopy, knee, surgical; with meniscectomy (medial OR lateral, including any meniscal shaving)	29881	942	572	-2.6%	0.92	-39%
Repair of ruptured musculotendinous cuff (eg, rotator cuff), open; acute	23410	1436	877	-2.6%	0.52	-39%
Repair, primary, disrupted ligament, ankle; both collateral ligaments	27696	959	591	-2.5%	0.80	-38%
Capsulorrhaphy, anterior; with labral repair (eg, Bankart procedure)	23455	1699	1050	-2.5%	0.79	-38%
Repair, dislocating peroneal tendons; without fibular osteotomy	27675	832	520	-2.4%	0.79	-38%
Arthroscopically aided anterior cruciate ligament repair/augmentation or reconstruction	29888	1643	1036	-2.4%	0.78	-37%
Repair, primary, open or percutaneous, ruptured Achilles tendon	27650	1102	696	-2.4%	0.83	-37%
Reconstruction of complete shoulder (rotator) cuff avulsion, chronic (includes acromioplasty)	23420	1633	1036	-2.4%	0.83	-37%
Repair, secondary, Achilles tendon, with or without graft	27654	1188	754	-2.4%	0.74	-37%
Capsulorrhaphy, anterior, any type; with coracoid process transfer	23462	1753	1129	-2.3%	0.79	-36%
Fasciectomy, plantar fascia; partial (separate procedure)	28060	592	382	-2.3%	0.73	-35%
Open treatment of knee dislocation, with or without internal or external fixation; with primary ligamentous repair, with augmentation/reconstruction	27558	1937	1260	-2.2%	0.84	-35%
Arthroscopically aided repair of large osteochondritis dissecans lesion, talar dome fracture	29892	1059	690	-2.2%	0.87	-35%
Capsulorrhaphy, anterior; Putti-Platt procedure or Magnuson-type operation	23450	1534	1001	-2.2%	0.77	-35%
Repair, dislocating peroneal tendons; with fibular osteotomy	27676	966	633	-2.2%	0.79	-34%
Osteotomy, proximal tibia, including fibular excision or osteotomy (includes correction of genu varus)	27457	1532	1016	-2.1%	0.82	-34%
Repair, primary, torn ligament and/or capsule, knee; collateral and cruciate ligaments	27409	1537	1022	-2.1%	0.77	-34%
Ligamentous reconstruction (augmentation), knee; extra-articular	27427	1130	752	-2.1%	0.79	-33%
Capsulorrhaphy, anterior, any type; with bone block	23460	1729	1151	-2.1%	0.79	-33%
Capsulorrhaphy, glenohumeral joint, posterior, with or without bone block	23465	1772	1182	-2.1%	0.80	-33%
Reconstruction of dislocating patella; with extensor realignment and/or muscle advancement or release (eg, Campbell, Goldwaite-type procedure)	27422	1179	787	-2.1%	0.78	-33%

(continued)

Appendix TABLE A1 (continued)

Description	CPT Code	Reimbursement, USD				
		2000	2020	CAGR	R ²	% Change
Reconstruction of dislocating patella (eg, Hauser-type procedure)	27420	1175	786	-2.1%	0.79	-33%
Repair, primary, torn ligament and/or capsule, knee; collateral	27405	1067	715	-2.1%	0.75	-33%
Reconstruction of dislocating patella; with patellectomy	27424	1175	791	-2.1%	0.77	-33%
Arthrotomy with meniscus repair, knee	27403	1004	680	-2.0%	0.78	-32%
Open treatment of acromioclavicular dislocation, acute or chronic	23550	889	606	-2.0%	0.76	-32%
Resection or transplantation of long tendon of biceps	23440	1169	810	-1.9%	0.77	-31%
Capsulorrhaphy, glenohumeral joint, any type multidirectional instability	23466	1689	1173	-1.9%	0.76	-31%
Tenodesis of long tendon of biceps	23430	1142	798	-1.9%	0.75	-30%
Arthroscopy, elbow, surgical; debridement, limited	29837	795	557	-1.8%	0.80	-30%
Arthroscopy, ankle, surgical; excision of osteochondral defect of talus and/or tibia, including drilling	29891	1009	709	-1.8%	0.83	-30%
Acromioplasty or acromionectomy, partial, with or without coracoacromial ligament release	23130	939	661	-1.8%	0.72	-30%
Arthroscopy, knee, surgical; with meniscus repair (medial OR lateral)	29882	1038	732	-1.8%	0.73	-30%
Arthroscopy, elbow, surgical; synovectomy, partial	29835	760	538	-1.8%	0.79	-29%
Arthroscopy, elbow, surgical; with removal of loose body or foreign body	29834	736	520	-1.8%	0.80	-29%
Arthroscopy, hip, surgical; with removal of loose body or foreign body	29861	1072	762	-1.8%	0.74	-29%
Open treatment of patellar dislocation, with or without partial or total patellectomy/reconstruction	27566	1327	944	-1.8%	0.81	-29%
Lateral retinacular release, open	27425	669	476	-1.8%	0.69	-29%
Arthroscopy, elbow, surgical; debridement, extensive	29838	875	626	-1.7%	0.81	-28%
Arthroscopy, elbow, surgical; synovectomy, complete	29836	862	618	-1.7%	0.80	-28%
Coracoacromial ligament release, with or without acromioplasty	23415	1044	748	-1.7%	0.81	-28%
Arthroscopy, knee, surgical; abrasion arthroplasty (includes chondroplasty where necessary)	29879	972	699	-1.7%	0.73	-28%
Repair, primary, torn ligament and/or capsule, knee; cruciate	27407	1164	840	-1.7%	0.73	-28%
Open treatment of acromioclavicular dislocation, acute or chronic; with fascial graft (includes obtaining graft)	23552	955	691	-1.7%	0.79	-28%
Arthroscopy, knee, surgical; drilling for intact osteochondritis dissecans lesion with internal fixation	29887	1097	794	-1.7%	0.71	-28%
Arthroscopy, elbow, diagnostic, with or without synovial biopsy (separate procedure)	29830	664	483	-1.7%	0.78	-27%
Arthroscopy, knee, surgical; debridement/shaving of articular cartilage (chondroplasty)	29877	897	656	-1.6%	0.72	-27%
Ligamentous reconstruction (augmentation), knee; intra-articular (open)	27428	1605	1178	-1.6%	0.77	-27%
Arthroscopy, hip, surgical; with debridement/shaving of articular cartilage (chondroplasty), abrasion arthroplasty, and/or resection of labrum	29862	1150	852	-1.6%	0.79	-26%
Claviclectomy; partial	23120	842	631	-1.5%	0.66	-25%
Arthroscopy, knee, surgical; drilling for osteochondritis dissecans with bone grafting, with or without internal fixation (including debridement of base of lesion)	29885	1054	797	-1.5%	0.72	-24%
Arthroscopy, knee, surgical; osteochondral autograft (eg, mosaicplasty) (includes harvesting of the autograft)	29866	884	672	-1.4%	0.69	-24%
Arthroscopy, hip, surgical; with synovectomy	29863	1116	855	-1.4%	0.73	-23%
Arthroscopy, knee, surgical; with meniscus repair (medial AND lateral)	29883	1128	889	-1.2%	0.81	-21%
Arthroscopically aided posterior cruciate ligament repair/augmentation or reconstruction	29889	1590	1292	-1.1%	0.82	-19%
Ligamentous reconstruction (augmentation), knee; intra-articular (open) and extra-articular	27429	1613	1325	-1.0%	0.80	-18%
Arthroscopy, hip, diagnostic with or without synovial biopsy (separate procedure)	29860	833	705	-0.9%	0.75	-15%
Mean		1171	783	-2.2%	0.78	-33%
Median		1102	748	-2.1%	0.79	-33%

^aCAGR, compound annual growth rate; CPT, Current Procedural Terminology; USD, US dollar.

APPENDIX TABLE A2
Current Literature Relating to Inflation-Adjusted Medicare Reimbursement in Orthopaedic Surgery

Study	Procedure Type	Years Studied	Inflation-Adjusted Reimbursement Changes	No. of CPT Codes in Study
Eltorai et al ¹³	General orthopaedics	2000 to 2016	Decreased by 10%-41%	25
Walker et al ⁴²	General orthopaedics	2000 to 2015	Decreased by 29%	≥200
Malik et al ²⁸	Shoulder and elbow	2002 to 2018	Decreased by 27%	39
Lopez et al ²⁵	Shoulder arthroplasty	2012 and 2017	Decreased by 7%-12%	3
Thornburg et al ⁴⁰	Hand (plastic surgery)	2000 to 2019	Decreased by 23%	20
Malik et al ²⁷	Hand surgery (orthopaedics)	2002 to 2018	Decreased by 21%	20
Haglin et al ¹⁹	Trauma	2000 to 2020	Decreased by 30%	20
Haglin et al ¹⁷	Hip and knee arthroplasty	2000 to 2019	Decreased by 39%	7
Acuña et al ²	Revision hip arthroplasty	2002 to 2019	Decreased by 19%-28%	8
Jella et al ²³	Revision total knee arthroplasty	2002 to 2019	Decreased by 24%-33%	6
Moore et al ²⁹	Arthroscopy	2000 to 2020	Decreased by 30%	20
Haglin et al ²⁰	Spine (excluding cranial neurosurgery codes)	2000 to 2018	Decreased by 28%	10
Lopez et al ²⁶	Lumbar spine fusion and discectomy	2012 and 2017	Decreased by 7%-11%	9

^aCPT, Current Procedural Terminology.